WILDLIFE MANAGEMENT

Project title: **Documenting Trends in Yellowstone's Beaver Population: A Comparison of Aerial and Ground Methods**

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Additional investigators: Douglas Smith

Objective: 1) To continue building a database on long-term beaver occupancy in Yellowstone National Park for trend monitoring of beaver activity and to estimate the density of colonies. 2) To compare the effort expended in time and funds with results achieved by both methods of survey. 3) To recommend a long-term strategy for monitoring beaver populations in YNP.

Findings: Ground surveys were completed between 8/23/99 and 11/20/99. Aerial surveys were completed late October 1999. Ground surveyors used a combination of evident feeding activity, animal observations, and construction on/around lodges and dens to judge active colonies. Aerial surveys relied upon the presence of a food cache, with or without a corresponding lodge/den, to determine active colonies.

Preliminary analysis indicates that ground surveys detected 68 active colonies, and aerial surveys detected 76 active colonies, 40 of which were independently detected by both methods. Survey routes were not completely similar. Aerial surveys detected some active colonies in sites not surveyed on the ground, while ground surveyors identified colonies not seen during aerial surveys. Detailed results and analyses will be presented in a formal report.

Project title: **Ecological Effects of Road Grooming on Bison in Yellowstone National Park**

Principal investigator: Dr. Robert Garrott
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Additional investigators: Daniel Bjornlie

Objective: To describe the distribution, movement, and behavioral patterns of bison in the Madison-Gibbon-Firehole area of Yellowstone National Park with regard to the presence of groomed roads and to evaluate the ecological consequences of this management activity.

Findings: Mr. Bjornlie has finished his second and final field season of the study and is currently finishing data analysis. A thesis will be produced by the end of the spring semester 2000. Bison trail monitoring, quantification of bison groomed road use, behavioral observations, and distribution and activity surveys were conducted during both seasons. No correlation was found between bison road use and an index of snowpack (1997-98 r-sq = 0.17, p = 0.039; 1998-99 r-sq = 0.24, p = 0.046). The number of bison groups traveling on roads was relatively high in late fall prior to road grooming, decreased in early winter as road grooming began, and then increased slightly and leveled off in mid-winter. Road use then peaked sharply in late March and early April after road grooming had ceased. This sharp increase also coincided with the melting of snow cover in the lower-elevation meadows and south-facing slopes. Of bison groups observed traveling on roads during the road-grooming period, 60% (33 of 55) had negative reactions to interactions with visitors on oversnow vehicles. Only 18% of observed bison travel during the road grooming period took place on groomed roads. Most travel (57%) took place off roads and established trails. Bison appeared to utilize corridors such as waterways for off-road travel pathways. Data indicated that the Mary Mountain trail between the Hayden Valley and the Firehole continued to be the major route for bison winter distribution shifts. Bison moved to the Madison River and to Cougar Meadows as spring meltoff progressed. Bison displayed behavior that minimized the cost of traveling through snow. For December through March, travel accounted for only 0.7% of observed snow-displacing bison behavior, while foraging accounted for 42.5%. A detailed annual report was distributed to all cooperators in October 1998 and 1999.

Project title: **Winter Recreation Effects on Wildlife in Yellowstone National Park**

Principal investigator: Dr. Robert Garrott
Phone number: See previous entry

Additional investigators: Scott Creel, Amanda Hardy

Objective: To assess the effects of winter recreation on wildlife populations in the Madison, Gibbon, and Firehole drainages in Yellowstone National Park. Specifically, to estimate elk and bison distributions, abundance, behavior, and fecal stress hormone levels for possible spatial and temporal correlations to varying types and levels of human activity throughout the winter.

Findings: Currently in the second winter of field work, we are repeatedly and randomly locating 36 radio-collared cow elk, obtaining density, distribution, and behavioral data on the elk in the study area. We are conducting bison surveys throughout the study area every two weeks for bison density, distribution, and behavioral data. We are collecting fecal and urine samples from radio-collared elk, unknown elk, and unknown bison for analysis of glucocorticoid levels (as a stress hormone indicator) and allantoin:creatinine ratios (as a nutritional deprivation indicator). We are conducting road, trail, and off-trail surveys throughout the study area, documenting elk, bison, coyote, deer, moose, trumpeter swan, and bald eagle sightings, along with group size, distance from road or trail, behavioral responses to human activity, and types of human activities and behaviors present. All data are being collected to detect possible spatial and temporal variation related to winter recreation activities and levels or other confounding variables such as winter severity or nutritional stress. We are processing the fecal samples from the 1998-1999 field season and are beginning analysis of the 1998-1999 data.

Project title: **Predator-Prey Dynamics in a Wolf-Ungulate System**

Principal investigator: Dr. Robert Garrott
Phone number: See previous entry

Additional investigators: Rose Jaffe, Lee Eberhardt, Doug Smith, Kerry Murphy

Objective: To examine the prey selection of wolves on the ungulate populations in the Madison, Firehole, and Gibbon drainages of Yellowstone National Park. Specifically, studying predation rates, prey selection, and wolf movements according to landscape attributes and prey abundance and distribution patterns. Aspects of prey selection being studied include species, sex and age class, condition of prey, and landscape features and snow conditions of encounter and kill sites. The data collected will be used to help predict impacts of wolf predation on the prey populations.

Findings: Data were collected from November 1998 to May 1999. Travel routes and locations of hunts and kills were recorded through the daily ground tracking of wolves in the study area to determine wolf

movements in relation to landscape features and prey distribution and abundance. Necropsies were performed on wolf kills to ascertain the species, age, sex, and condition of the prey to study prey vulnerability and wolf prey selection. Detailed snow condition data were also collected by digging snow pits and recording snow layer information, and sinking depths of wolves and elk were taken at hunt and kill sites to examine the possible effects of snow conditions on prey vulnerability. All bison calf kills were located on snow-free thermals, so no snow condition data were recorded. The amount of data collected was determined by daily wolf activity.

The Nez Perce pack, with four adults and three pups, were detected in the Firehole Drainage 136 days, establishing the area as an important part of their winter territory. The Chief Joseph pack moved through the study area twice for three days with six wolves in December and five wolves in February. Tracks of one to two uncollared wolves were detected in the study area on two occasions. The ungulate prey base in the study area consisted of approximately 900 bison and 650 elk throughout the winter. Fifty definite and 11 probable wolf kills were located and necropsied, including 31 elk calves, 11 cow elk, 8 bull elk, 2 unknown adult elk, and 9 bison calves. Prey switching was evident; elk calf kills were located from November through March, increasing steadily from November to February and decreasing in March, adult elk kills were located throughout the winter with an increase in spring, and one bison calf kill was located each in December and February, increasing in March and April. Of the 173 days the wolves were monitored, radio signals were detected 136 days and followed 97 days. Wolf tracks were located and followed, and travel routes recorded 79 days for a total of 307 km.

Project title:	**Determining Forage Availability and Forage Use Patterns in the Hayden Valley**
Principal investigator:	Dr. Lynn Irby
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Additional investigators:	Peter Gogan, Thomas Olenicki, Robert Garrott

Objective: 1) Delineate seasonal forage use patterns by bison in the Hayden Valley. 2) Determine long-term and short-term effects of ungulate foraging on vegetation in the Hayden Valley. 3) Identify cost-effective monitoring strategies for monitoring impacts of ungulates on vegetation. 4) Estimate annual production and standing crop available to ungulates in the Hayden Valley.

Findings: We initiated fieldwork in June 1998. During the 1999 field season we monitored standing biomass via grazing exclosures at three fixed sites and 70 randomly selected plots. Biomass was estimated using either clipping or multispectral radiometry calibrated via clipping. We were also able to complete ground calibration for three LANDSAT overpasses and do offtake estimates in two blocks in

the Hayden Valley using a combination of the grazed loop technique and multispectral radiometry. Fine and medium scale criteria for bison selection of foraging sites will be facilitated by aerial and radio-telemetry locations (medium scale) and locations of bison using a laser range-finder (fine scale) The project is proceeding on schedule.

Project title: **Impacts of Roads on Movements and Habitat Use by Bighorn Sheep on the Northern Range**

Principal investigator: Dr. Lynn Irby
Phone number: See previous entry

Additional investigators: John Mack, Kayhan Ostovar

Objective: 1) To identify movement patterns, seasonal ranges, and relationships among bighorn groups on the Northern Range. 2) To determine how current roads impact movement and behavior. 3) To identify areas that would be sensitive to new road construction.

Findings: Mr. Ostovar completed his thesis in December 1998 to complete the movement and road impact portion of the study. During winter 1999, I monitored survival of sheep from ground locations. All sheep with radios survived through April 1999. During summer 1999, I conducted a road shoulder survey to determine the relative suitability of road margins as escape blockages and foraging sites for sheep. Areas used by sheep were in steeper terrain than areas not used by sheep but roadside vegetation was not different. Very few road margins precluded sheep movement off of roads. Two papers based on Mr. Ostovar's thesis have been written and will be submitted to professional journals in 2000. Museum specimens we collected are limited to DNA archival specimens from captured animals. They are stored with other DNA material at Mammoth.

Project title: **Epidemiology and Pathogenesis of Brucellosis in Yellowstone National Park Bison**

Principal investigator: Dr. Thomas Roffe
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Additional investigators: Jack Rhyan, Keith Aune

Objective: Determine the natural course of brucellosis in free-ranging bison. Determine modes of

transmission. Provide information on the prevalence of infection and abortion.

Findings: We currently have 55 collared bison entering the fifth year of this project. Our focus will be on younger female bison coming into their first reproductive years. Based on data we have collected to date, bison apparently develop clinical brucellosis during their first pregnancy after exposure to the bacteria. Repeat reproductive failures, induced by brucellosis, appear to be uncommon. We also plan to focus on vertical transmission from cow to calf. Last spring we reported eight neonatal mortalities during the 1999 calving season. Three of these dead neonates were brucella-culture positive.